for the most acute problem of Kerala, viz., abnormally high rate of unemployment. According to a survey carried out by the State Statistics Department open unemployment in the State was as high as 4.2 per cent (all-India 0.6%) and under-employment 9.6 per cent of the total population (all-India 6.0%).

The unemployment problem of Kerala might not have been so severe had there been a correspondingly rapid development of industries over the past few decades. In this sphere the State suffers from certain handicaps. Although the industrial sector in Kerala absorbs a high proportion of the working force (Kerala 19.1%; India 9.4%), the majority of them are engaged in very low productivity industries. The two major industries of Kerala, viz., coir and cashewnut are technologically very backward. Coir industry, which is organized as a cottage industry, absorbs 4-5 lakh persons. Cashewnut-processing, although organized on the lines of factory industry, is almost entirely unmechanized. As a result, labour productivity in the secondary sector is extremely low. Because of this, industrial sector in Kerala does not create any sizeable reinvestible surplus and the process of capital formation is hampered. The types of industries in which Kerala predominates, have not also aided the development of entrepreneurial talents. Kerala lacks in a long tradition of industrial enterprise. Most of the large scale industries which now exist in Kerala, for example, Fertilizers & Chemicals Travancore Ltd., Travancore-Cochin Chemicals Ltd., Indian Aluminium Company and Aluminium Industries Ltd., were started under the direct initiative of the governments of the erstwhile States of Travancore and Cochin or industrialists from other neighbouring States of India. No distinct body of local entrepreneurship has, therefore, developed in the State.

In addition, lack of sizable mineral deposits (except Ilmenite) adds to the difficulties which have been retarding industrial development of the State. Coal as well as all metallic raw materials for the industries of Kerala have to be transported over long distances from other parts of the country. But there are favourable factors compensating some of these deficiencies in the economic endowments of the State. The agricultural sector of Kerala abounds in a rich variety of high value yielding cash crops like coconut, pepper, rubber, arecanut, tea, cashewnut, cardamom and coffee. These crops not only provide considerable incomes for the farmers, but are a good source of foreign exchange earnings and provide valuable raw materials for the industries. A vast potential for generation of low-cost hydro-electric power makes up for the absence of fossil fuels. Rich forest and fishery resources, a highly intelligent and literate labour force, easy accessibility to most parts of the State through a wide network of roadways, and the scenic beauty of its landscape capable of attracting tourists, are some of the other assets of Kerala.

As a result of the present survey, several lines of technically and economically feasible developments have been suggested in this report in the industrial and other fields. The total impact of these developments would be to raise the per capita income of the State from the present level of Rs. 240 (at 1955-56 prices) to Rs. 404 (at the same price level) by 1970-71. State income would rise from Rs. 400 crores (at 1955-56 prices) to Rs. 812.8 crores, i.e., at an average annual rate of 10.3 per cent. The targets are undoubtedly on the high side, but the needs of Kerala in the context of its huge unemployment and very low per capita income demand a rather high

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India coastline, 30 per cent of the country's fish production came from the coast of Kerala. There is, however, still ample scope for increasing the output of fish. Only the fringe of the potential for off-shore fishing has been tapped up till now. Similarly, it is believed that the output of fish can also be increased considerably from the coastal fisheries without subjecting the fishing grounds to undue pressure. Introduction of mechanized fishing and better fishing gear can add considerably to fish production. However, as it is, the fishermen are the most depressed class of persons in the economy, and unemployment is at its maximum among them.

1.42 Development of fisheries is of particular importance in case of Kerala in view of the large food deficit of the State. The requirements of rice for a balanced diet could be considerably reduced if it is adequately supplemented by tapioca and fish. Tapioca by itself is not an adequate substitute for rice requirements since it lacks in proteins. However, its food value can be considerably enhanced if it is combined with a sufficient quantity of fish.

Secondary Sector

1.43 The secondary sector covers mining and industry. Mining activity is comparatively limited in Kerala in view of the meagre occurrence of minerals. During 1955-56 mining contributed only 0.6 per cent of the State Income (all-India 1%). The chief mineral asset of Kerala is the beach sand. Ilmenite is the most important variety of the beach sands. Besides some fine quality china-clay, of which there are good reserves, other items of mineral wealth of Kerala are not of any particular importance.

1.44 The industries of Kerala, both the factory[1] and the non-factory type, are marked by a low level of productivity as shown by Table 4. The main reason for this is the backwardness of technology employed as would be true of other parts of India as well. While this may not apply to the modern industries run on a large scale basis, in some of which indeed the State has been a pioneer, the overall picture of industry presented as a whole is, nevertheless, one of poor technological level. Further, during 1955-56, the organized factory industries employed 17.5 per cent of the working force in the secondary sector (9.7 lakhs) as against 21.8 per cent in India. Moreover, in both the factory and the non-factory categories, the major share of employment opportunities is monopolized by a few industries which can by no means claim to be in the forefront of modern industries.

1.45 In the non-factory sector, out of a total working force of 7.8 lakh persons, almost 50 per cent of the workers are employed in the coir industry, the foremost industry of Kerala. As in most cottage industries, the maximum degree of mechanization in coir industry never goes beyond a spinning wheel. In Malabar, even that is missing, since spinning operations are mostly carried on with hand. Similarly in the factory sector, the three major industries, viz., cashewnut, textile and coir factories which account for 64 per cent of factory employment, are entirely unmechanized.

1 Factory type of units are defined as those falling within the coverage of Section 2 in (*i*) and (*ii*) of the Factories Act, 1948. These include all those factories employing more than 20 workers as well as those employing between 10 to 20 workers, if using power.

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formed of gneissic debris by sub-aerial decomposition. The formation of coastal areas consists mostly of sands deposited by the sea. The soils are generally of poor fertility status. Some peculiar formations are found in the taluks of Ambalapuzha, Kuttanad, Vaikom and Shertallai and go by the name *peaty* or Kari soils. These are black and heavy and contain plenty of potash and 10 to 30 per cent organic matter. However, the soils are highly acidic due to the decomposition of organic matter under anaerobic conditions, presence of iron and aluminium salts and absence of nitrification. Attempts to reclaim the soils by liming and improvement of drainage have so far proved unsuccessful. In Trichur and Mukundapuram taluks there is yet another category known as *Kole* soils. These are fertile alluvial soils. The soils of Malabar area are quite different. They are mostly red soils formed *in situ* from the micaccons or granitic rocks below under the influence of weather and climatic conditions. The fertility of the red soil is poor. They contain very low proportions of organic matter and nitrogen. But these soils contain ferrous and aluminium ions in fairly large proportions and in the absence of humous this situation results in reversion of phosphate—a state where phosphorous when applied in the form of fertilizers, does not become readily assimilable by the plants.

Land Utilization

2.9 The fact that Kerala has drawn upon the margin of cultivable land much more than in the rest of India is borne out clearly by Table 8.2A The net sown area in the State during 1956-57 was 4,525,000 acres, that is 47.16 per cent of the total area. This is about 8 per cent more than corresponding all-India proportion (39.1%). The proportion of fallow lands in Kerala is also very low. (Kerala 4.4% : all-India 7.5%). A higher proportion of total area devoted to cultivation becomes all the more significant in view of the fact that forests cover about 26 per cent of the total area of the State compared to the all-India average of 17.44 per cent.

2.10 During the period 1951–57, there has been an overall improvement in the pattern of land utilization in the State. There have been significant increases in the area under forests (15.8%), permanent pastures (19.8%), land under tree crops (18.1%), net area sown (29.8%), and the area sown more than once (24.9%). These increases were mostly at the expense of cultivable waste, which declined by about 40 per cent during the period. The next important decline (16.7%) was in the barren and uncultivable lands. The area sown more than once rose by about 25 per cent, but this was partly offset by an increase of 35 per cent in the area under current fallows. (Table 8)2A

2.11 Another notable feature of the agricultural sector in Kerala is the high intensity of cropping.[1] During 1956-57, the gross sown area was 5.6 million acres and the net sown area was 4.7 million acres. This works out to a crop intensity of 119 per cent (all-India 113%; Punjab 130%; Maharashtra 120%). However, if the field crops alone are taken into account, crop intensity works out to as high a figure as 150 per cent. It is the latter percentage which gives a more accurate idea of the

[text continues on p. 25]

[1] Intensity of cropping is the ratio between gross cropped and net cropped area.

2A [see p. 274, category 116 -- Analyst]

Chapter 6

Minerals

FROM THE POINT of view of its industrial development, Kerala's mineral resources are a weak link in the State's economy. With a share of only 1.7 per cent in the all-India production of the minerals, Kerala lags behind most other States in the output of minerals. During 1955-56, the net value contributed by the minerals (Rs. 1.95 crores) was 0.6 per cent of the State income against one per cent of country's income.

6.2 The important minerals of the State are beach sands comprising ilmenite, monazite, rutile, sillimanite, zircon, china-clay and tile-clay. Among these ilmenite and china-clay are the most prominent. The reserves of these minerals are adequate to last more than 20 years and may, therefore, be classified as "minerals with adequate reserves". Graphite, iron ore and mica are also found, though only in very small quantities. The deposits of limeshells occur in lakes and along the coast, but are rather modest in content. The metallic minerals and fossil fuels, however, are almost completely absent. It is the deficiency of these minerals which presents an obstacle to the growth of large scale industries.

6.3 Apart from beach sand collection and limeshell winning from the lakes and estuaries, there are eleven workings, all open cast. These do not include tile-clay working about which no data is available. The number of persons engaged in all these 11 mining enterprises (inclusive of beneficiation) is roughly 6,900. However, according to 1951 Census, the number of persons employed in mining as well as in stone-quarrying is about 18,000, i.e., 0.3 per cent of total working force (all-India 0.4%).

6.4 Table 28[1] gives the output of minerals from the various workings and their value. In 1955, the value of minerals production was Rs. 1.35 crores. Next year, the value of production went upto Rs. 1.95 crores, representing an increase of approximately 37 per cent. This steep rise was mainly due to the increase in ilmenite production, which went upto 314,348 tons in 1956 from 231,585 tons in 1955. Production registered a further increase of about Rs. 20 lakhs during the next year, (that is, 1957), reaching a level of Rs. 2.1 crores. This was maintained during the next two years, that is, 1958 and 1959. In 1960, however, there was a setback as one of the mineral sand companies had since closed down; and it is likely that the value of the output might not have exceeded Rs. 1.3 crores.

[Text continues on p. 92]

[1] [Table 28 appearing on p. 289 of the text, has not been processed -- Analyst]

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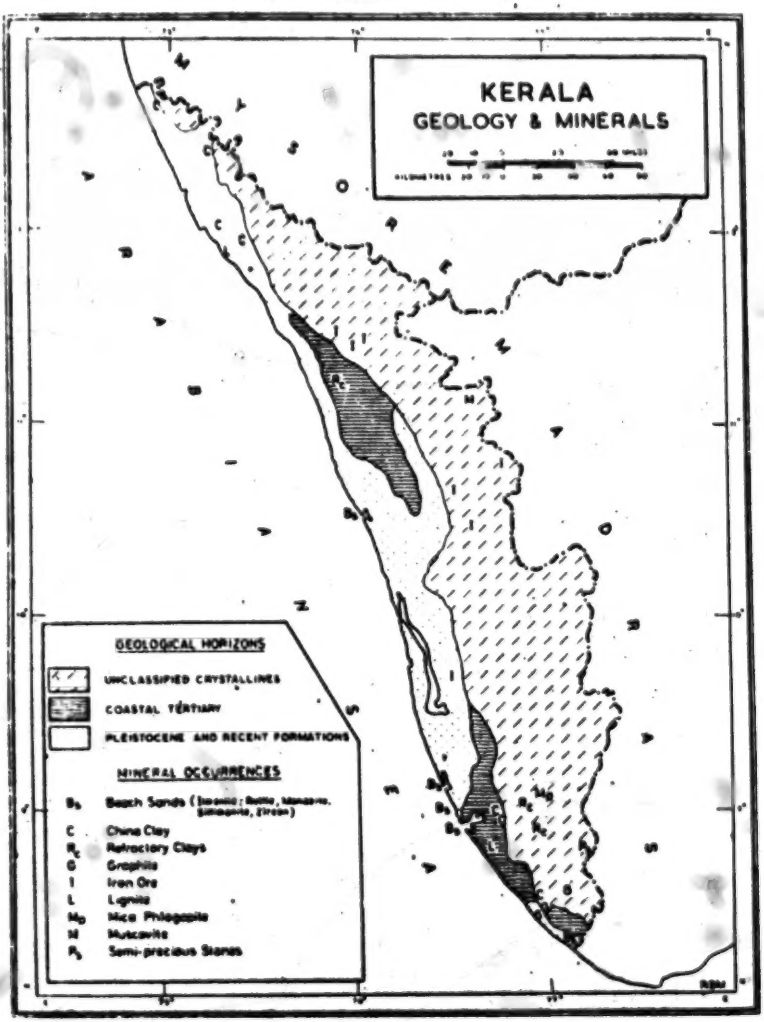
MAP 9

102
133
135



rest of the production is exported to various countries, the bulk of it going to the USA and the UK. Export figures are given in Table 29 for the period 1956–59.

6.17 Irregular supplies made through the Koilthottam port, mainly due to labour difficulties, have resulted in the loss of contracts with importers in the USA. Export possibilities of ilmenite are now limited only to two contracts to UK totalling 1,50,000 tons per year. This setback has occurred in spite of the fact that the Chavara ilmenite has a high TiO_2 content (55-60%) and is cheaper when compared to Malayan ilmenite (about 45% TiO_2) which, however, finds a ready export market.

6.18 India, which at one time used to hold almost a monopolistic position in the export of ilmenite has now to face competition. Side by side with the expansion of titanium industry, other world sources for supply of ilmenite have come into operation as in Norway, Canada, Malaya, Australia, South Africa, etc. Whereas in 1940 India used to contribute 90 per cent to world production of ilmenite, now its share is only 25 per cent.

6.19 In view of the rapid expansion of India's steel industry, the consumption of TiO_2 pigment is itself expected to go up. The total requirements of ilmenite by 1965-66 would be 150,000 tons a year for export and 36,000 tons a year for the manufacture of TiO_2 pigment, on the basis of proposal for expansion of Titanium Dioxide plant at Trivandrum incorporated in this report. Table 30[*] gives demand for Titanium Dioxide pigment from steel industry and various other sources. The two existing companies can produce about 160,000 tons a year. Extra capacity of 30,000 tons a year will have to be installed, and this along with certain improvements suggested earlier may require an investment of Rs. 20 lakhs. Very little increase in labour force is envisaged. The existing labour force itself appears to be excessive, since the output per man per shift works out to a low level of 0.4 tons.

6.20 During the Fourth Plan period, steel production is expected to double itself. Therefore, by 1970-71, the demand for Titanium Dioxide may also be expected to be roughly double of the demand in 1965-66. This would necessitate another 30,000 tons of ilmenite per annum. Total requirement of ilmenite by 1970-71 would thus be 220,000 tons a year, comprising of 150,000 tons for export and 60,000 tons for the manufacture of Titanium Dioxide. This would involve further additional outlay of Rs. 10 lakhs. Even this order of expansion can be achieved with the existing labour at an output of one ton per man per shift which would measure a fairly reasonable level of productivity.

Monazite

6.21 Monazite is a phosphate of thorium and cerium with rare earth elements and small quantities of Uranium Oxide. It constitutes a source of the radio-active element, thorium being used for atomic energy purposes. Monazite was first discovered in India, by C.W. Von Sohomberg, a German citizen, in 1909 along the beach at Manavalakkurichi.

6.22 Monazite occurs along with other heavy minerals in the beach sands. Reserves of the order of 6.7 million tons are estimated to be present in the bar between Neendakara and Kayarkulam. There is, however, no production of monazite

[*] [Table 30, appearing on p. 290 of the text, has not been processed -- Analyst]

11: India G-4, 5 (1960-1961) 1962 AWll Kerala AWll

135 concentrates from Chavara, the Manavalakkurichi (in Madras State) material being preferred because of its higher thorium content.

317 328 439 6.23 A rare earth factory is located in the State at Alwaye, which processes 1,500 tons of monazite a year ; but it obtains its requirements from Manavalakkurichi in the Madras State. This factory produces Thorium Oxide, rare earth salts and Trisodium Phosphate. The Chavara Monazite may be considered for use in the rare earth factory instead of the monazite from Manavalakkurichi in Madras State, particularly in view of the fact that monazite would be a byproduct of ilmenite which is won in larger quantities in Kerala and may, therefore, prove cheaper.

Rutile

317 6.24 Rutile is another titanium mineral occurring in smaller quantities in the beach sands. The beach washings contain, on an average, about 4 per cent of rutile. A portion of the sand bar at Neendakara is estimated to contain 740,125 tons of the mineral.[1] Kerala is the only State in India producing rutile.

317 328 6.25 At present only one of the mineral sand factory units produces this mineral. Electro-static separators are used in concentrating rutile from the non-magnetic tailings after the extraction of ilmenite. Recovery is one-fifth of the rutile content of raw sand and the rest is allowed to go into the tailings for lack of equipment.

*433 317 328 439 435 6.26 Only small quantities of rutile are produced. During 1959, 482 tons valued at Rs. 4.75 lakhs were beneficiated. The current price is Rs. 1,000 a ton. The mineral is not utilized in the State, but is sent to Bombay and Calcutta for the manufacture of welding rods. During 1957, 155 tons of rutile were imported to meet the requirements of this industry. Future requirements of welding rods within India is estimated to go up from 417 m. ft. in 1960-61 to 2,022 m. ft. in 1970-71.[2] To meet this rise in demand, output of rutile would have to be stepped upto 6,750 tons by 1970-71. An expansion in capacity of this order would require an investment of the order of Rs. 10 lakhs.

Sillimanite and Zircon

135 6.27 Sillimanite as well as zircon occur in small amounts in beach sands in association with ilmenite and other heavy minerals. They average 5.9 per cent and 4.2 per cent respectively of the beach washings. In addition, 1,916,260 tons of sillimanite and 799,350 tons of zircon are estimated to form a part of the Neendakara bar.[3] Only experimental production of either of these minerals has been taken up so far.

*433 317 6.28 Sillimanite is mainly used in refractories, but the internal requirement of sillimanite refractories is very small. Moreover, the material from Assam which is of a massive variety can be shaped into blocks and used directly. Export possibilities are also dim and due to the development of artificial mulite bricks from domestic kyanite in the USA. Exports have dropped from 20,000 tons to 6,000 tons in 1957.

[1] *Peaceful Uses of Atomic Energy*, Proceedings of the Second International Conference, P. 102.
[2] NCAER estimates.
[3] *Peaceful Uses of Atomic Energy*, Op. Cit, p. 102.

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investment for this will be about Rs. 5 lakhs and additional employment for 350 persons.

Graphite

6.40 This mineral occurs in the form of disseminated grains, stringers and thin veins in surface laterites and the crystalline rocks underneath, mainly charnockitic and associated types. While the disseminated grains occur in charnockitic rocks, the worthwhile occurrences appear to be confined to the area of leptynites.[1]

6.41 Surface occurrences of graphite are known to occur in Kerala at a number of places, viz., Plachikuzhi, Nellimood, Narical, Ozhupara, Karipur, Perumpallimuzhi and Vellanad in Nedumangad taluk, Puliyarakonam and Chenagalloor in Neyyattinkara taluk and in various other isolated localities in Trivandrum district. The occurrences are being investigated geo-physically using electrical methods without appreciable success. This is probably due to the electrical anomalies being marked by the laterite host rock. Perhaps geo-chemical methods may prove more fruitful.

6.42 This mineral was mined in Kerala between 1898 and 1911 by the Morgan Crucible Company, altogether 35,000 tons of material being won. Consequent upon the discovery of graphite in Madagascar, operations ceased in Kerala. The most productive mine was at Vellanad. Recently operations were started at Aukulam on a small scale, but were suspended shortly thereafter. The production has been negligible. The prime need in the near future will be to have a more detailed prospecting on the lines suggested.

Iron Ore

6.43 Quartz-magnetite bodies are reported from various localities. In all these cases, the top of these bodies is laterized and often very rich in iron. However, within a few feet the iron content decreases very appreciably.

6.44 The Nanminda occurrence (Pookunnu Hill) is probably the largest one. It would be necessary to explore this area in detail, possibly with core drills before any reasonable conclusion can be drawn. The ore body is steep dipping and will have to be won by underground mining, and further, magnetite concentrate obtained. All this would make the prospect very dear when compared to other iron ore occurrences elsewhere in the country being currently exploited. Further, the possibility of establishing a pig iron plant based either on low-shaft furnaces or electrical furnace techniques, is fraught with difficulties because of the non-availability of coke or lignite and fluxing material within the State.

Limeshell Deposits

6.45 Even though no important horizon of limestone is found in the State, limeshell is found to occur in the various backwaters and also in the estuaries of some

[1] I.C. Chacko: *A Sketch of the Geology of Travancore.*

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of the rivers. The best known among these is that of Vembanad lake ; other less important occurrences are in the estuaries of the Kadalundi and Korapuzha rivers, Kozhikode district and Cranganore lake. Only a few of these tracts have been prospected so far. A systematic exploration programme should, therefore, be initiated in all the backwater and estuarine tracts.

6.46 The deposits in Vembanad lake were surveyed by the Travancore Cement Company in 1946. There was no layer of limeshell as such, but it occurred amidst sands and clays, the total thickness of the mixed deposits varying from 1-7 feet. Reserves as estimated then were 3 million tons.

6.47 In addition, in the estuary of the Kadalundi river 400,000 to 500,000 tons of limeshell are estimated to be available in an area of 300 acres.[1] About 100,000 tons of material is also likely to be available from the lower reaches of the rivers Pullut and Thathapally which drain into the Cranganore lake.[2]

6.48 These limeshell deposits provide a raw material of very high purity and which is eminently suitable for use in the chemical industry and in the manufacture of white cement.

6.49 The present production is mainly from Kottayam and Alleppey districts, where the Vembanad lake deposits are exploited. Small quantities are also won from the Kadalundi and Korapuzha estuaries. Details of production available for 1959 are given below:

District	*Quantity* (Metric tons)	*Value* (Rs.)
Alleppey	9,098	76,342
Kottayam	86,509	696,333
Kozhikode	500 to 1,000	N.A.

6.50 Excepting small quantities sent to the adjoining States from Kozhikode district, the State's output is consumed within the State. The cement company consumes 70,000 tons of shells a year for producing 50,000 to 60,000 tons of grey cement. About 26,000 tons a year are used in lime-burning of which 25,000 tons come from the Vembanad lake.

6.51 Other limeshell utilizing industries which are under active consideration are a sand-lime brick factory at Pallathara with a capacity of 44,000 bricks a day and a calcium carbide factory at Chingavanam with a capacity of 10,000 tons a year. Both these would use shells from Vembanad lake and their annual requirements would be 8,500 tons and 10,000 tons respectively.

6.52 The total annual requirement during 1961–66 would thus be 108,500 tons of shells from the Vembanad lake. In view of the fact that the cement factory has been in existence for the last 11 years and has already consumed about a third of the original reserve of 3 million tons, proposals for new limeshell-based industries in the same area introduce problems regarding assured reserves of raw materials and their conservation.

[113]

[1] *Administration Report of the Geological Department*, Government of Kerala, 1958-59, pp. 3-4.
[2] Ibid pp. 3-4.

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6.53 First, possibilities of an alternative source, e.g., shells from the sea, should be assessed quantitatively, which could possibly meet requirements of the local lime-burning units. This would relieve the pressure on the lake and estuarine deposits, which could then be conserved for larger industrial units.

6.54 Secondly, new industries could perhaps be located near other known shell deposits. A case in point here is the Calcium Carbide Factory requiring about 10,000 tons annually, which could be located in the Kadalundi area where reserves of the order of 400,000 to 500,000 tons are available. In this location the unit would be assured of its shell requirements for the next 40 to 50 years on the basis of an average annual requirement of 10,000 tons, whereas in the Vembanad lake location, reserves would last only for 15 to 20 years.

6.55 The requirements of the sand-lime brick factory, however, are only about 3,500 tons a year and it should be possible to accommodate this requirement from the present consumption of 25,000 tons by the lime-burning industry.

6.66 In this context, it would be relevant to mention that in absolute terms, the accretion of shells is rather small; and in terms of the proposed rate of exploitation this accretion is even negligible. Further, the proposal to construct a bar across the mouth of the Vembanad lake would change the salinity of the water and would very likely put an end even to this small accretion. As to whether the shell organism could be simulated to thrive on a large scale is a problem for long term research.

6.57 In the meantime, in view of the rapid depletion of reserves in the Vembanad lake, strict control should be exercised over the exploitation of this deposit with periodical inspection to check unauthorized collection. The rate of exploitation may be kept at the present level but should not be allowed to rise.

Mica

6.58 Two varieties of mica, muscovite and phlogopite are known to occur in the State. Muscovite is reported from Kulikhoor, and Sholayaramson from Palghat district and phlogopite from Punalur in Quilon district. However data relating to reserves are not available for any of these deposits.

6.59 At Kulikoor in Palghat district, a few prospecting pits have been put down which exposed a small vein of ruby mica with very little strains. The presence of ruby mica on a fairly large scale along the same belt in the adjoining State may be taken as a favourable indication. Further prospecting should be undertaken in the area.

6.60 Production from the only mine in the State at Punalur has been intermittent. Figures for production since 1957 when mining activity was revived are given below:

Year	Quantity (Metric tons)	Value (Rs.)
1957	72	40,000
1958	72	40,000
1959	46	23,000

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6.61 Formerly mica used to be exported from this mine, but now because of its inferior grade and development of cheaper substitutes, the market has ceased to exist. Production has been giving demand and the mine is again on the verge of closing down.

Quartz-Sand

6.62 An extensive deposit of quartz-sand occurs along the Shertallai-Pattanakad-Pallipuram-Panavally area. Reserves of the order of 80 million tons are said to exist here. However, all the sand is not glass grade, being gritty in large portions.

6.63 There are two workings in Shertallai taluk, one at Pallipuram and the other at Panavally. Mining is selective in that only such areas which contain finer material are worked. The workings are not mechanized. The raw sand is sieved and winnowed at the workings. Further sieving is done at the glass factory, the final recovery standing at 50 per cent of the original, and represents the portion between 30 and 80 mesh screens.

6.64 About 3,000 tons sand is produced annually with a pits-mouth-value of Rs. 1.50 a ton. A major portion of the output is consumed by the glass factory at Alwaye, while the rest is supplied to silicate factories in the State and consumers outside the State.

6.65 A sand-lime brick factory is coming up at Pallathara in the public sector with an installed capacity of 44,000 bricks a day and it will be a major consumer of quartz-sand. Its sand requirements would be 33,750 tons a year. The total raw sand requirements by 1965-66 would be 46,000 tons a year. Exploitation at this rate would require an investment of Rs. 2 lakhs. By 1970-71, the sand requirements would further increase to 90,000 tons a year requiring an additional investment of Rs. 15 lakhs. At the same time, an integrated scheme to work the sands systematically and utilize both the coarse and finer grades should be undertaken, rather than leaving the sand collection to contractors.

Salt

6.66 Salt, besides being an essential ingredient of food, also serves as a basic raw material for the manufacture of alkalies. It is commonly extracted from sea water by solar evaporation. Production of salt in Kerala during the last few years has been as follows :

Year	Quantity (Metric tons)	Value (Rs.)
1955	56,094	1,180,000
1956	783	10,000
1957	336	5,000
1958	708	10,000
1959	1,007	13,000

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formation of a large number of companies which together won 600 ozs. of metal. During the last war, operations were again commenced but mainly for pyrite, which were also given up.

6.76 It is obvious that all surface occurrences have been worked out. However, prospecting for hidden lodes could still be carried out. A preliminary survey by panning up the stream to the heads of the tributaries in search of mother lodes is indicated.

6.77 *Lignite*: A lignite occurrence two feet to eight feet thick exposed on the beach at Varkalai had been reported, but it has proved to be abortive on drilling.

6.78 *Semi-Precious Stones*: The presence of semi-precious stones like cats' eye, amethyst, and iolite are reported from various places in Nedumangad taluk, Thiruvalla and Kollengode, but none has proved worthwhile. Recently beryl has also been reported from mica bearing area at Kulikkoor in Palghat district. .

6.79 *Kankar*: In the black cotton soil tracts of Kozhinjampara and Chittur firkas in Palghat district kankar limestone is met with and is used locally in lime burning.

6.80 *Gypsum* : It is known to occur in similar soils in the Coimbatore district of Madras State. An intensive search may, therefore, be made in these black cotton soil areas for this mineral.

CONCLUSIONS

6.81 Mineral resources play a vital role in the economic development of any region. The process of industrial development generally involves a shift from industries based on primary raw materials like agricultural or forest produce to more technologically advanced industries using a higher content of metallic minerals. Kerala is unfortunately placed in this respect as its mineral resources are marked by absence of any of these basic minerals, namely, coal, iron and copper.

6.82 Some of Kerala's industries, however, do have good prospects. Beach sands, the chief mineral assets of Kerala, are the source of titanium bearing ilmenite. Although possibilities of increase in export of this sand are not bright, internal demand for ilmenite from the Titanium Dioxide industry is expected to rise substantially. Similarly, extensive deposits of quartz sand and fine quality china-clay occur in the State. This report envisages a considerable expansion in demand for both of these from existing industries as well as from new factories suggested for production of high tension insulators, sand-lime bricks, etc. In contrast to these three, the other minerals have only limited potentials of development. Thus monazite which contains the radioactive element thorium is available in quantity but has a restricted demand at present. On the other hand, the known reserves of limeshell are in short supply and do not offer scope for expansion of the cement industry based on it.

6.83 Among the rest, iron ores are not capable of being developed for lack of coal while mica and graphite would depend entirely on future discoveries.

6.84 On the whole, an increase in mineral production from a value of Rs. 130 lakhs in 1961 to Rs. 197 lakhs by 1965-66 and Rs. 250 lakhs by 1970-71 is envisaged here. Between 1956 and 1961 there was, however, a fall in the value of output from

Chapter 7

Power

KERALA HAS IMMENSE potentiality for the generation of hydro-electric power. The State does not possess any resource of coal or oil (within its own boundary) for generation of power but there are 44 rivers which constitute a storehouse of hydel power. This favourable factor compensates for the absence of any fossil fuels. Investigations so far have led to an estimate of this potential to be roughly of the order of 1,539 MW.[1]

7.2 One of the basic problems of Kerala's economy is posed by the situation of acute unemployment prevailing in the State. A long run solution to this lies in an intensive programme of industrialization only. An accelerated pace of industrial development, in turn, requires an ensured supply of adequate power. One possible way of looking at power development activities is to consider power as a complementary factor in the programme of industrialization of the State. Targets for power generation capacity in such cases should be fixed slightly higher than what the demand is expected to be.

7.3 The alternative approach, which is the more feasible one for Kerala, is to consider power, generation itself as an industry and to develop the State's abundant hydro-power resources to the maximum extent possible. The surplus of electricity generated over local requirements could be exported to the neighbouring State of Madras, which is not so well placed in respect of its power resources as Kerala. The electricity exported would provide a means of earning revenue, which is turn could be utilized for capital formation within the State. Moreover, a surplus in power generation capacity is desirable in itself since for a State like Kerala, where some factors deterrent to industrialization have been operating in the past, a regular supply of adequate power should be made to act as an incentive for setting up new industries. Planning for a power surplus and export of electrical energy to the neighbouring States should, therefore, form the keynote of the future power development policy in the State.

DEVELOPMENT OF POWER

7.4 The process of power development in the State is already well set. What is now required is to harness the huge energy potential of the State and convert it

[1] By the Central Water and Power Commission.

[Text continues on p. 112]

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Other Occupations

Fishing, both sea and freshwater, plays a big part in the life of Kerala but, as usual in India, is primitive in technique and organisation. It has, however, some interesting features: Portuguese influence is obvious in the so-called 'China nets' and the crossbow used for shooting fish from river-banks, [46] and there are many varieties of basket-work fish-traps. The catch of 'sardines' is largely used for manuring coconut; prawns are taken in flooded paddy-fields, the skins used as manure and the pulped flesh exported. Normally Burma was a good customer for prawns; the time of transport raised no difficulty as a high degree of putrescence was regarded with favour.

Travancore has a hydro-electric plant at Pallivasal on the Mudrapuzha River, with a capacity of 21,000 kW which can be increased to 36,000. The power is used for the industries of Cochin town and Ernakulam, of which the production of soap and cosmetics from copra is the most important. It also powers the sole Indian aluminium works, at Alwaye, formerly dependent on imported alumina but now increasingly supplied from Muri in Bihar (591 above); and a recent development is the use of electric pumps for 'de-watering' the *cole* lands. The great reservoir impounding the Periyar headwaters was built to supply irrigation water, by tunnel, to the Madras side, but may possibly be developed for power in the future.

Except for local clays and laterite, the only mineral deposits are the ilmenite, monazite, and zircon sands of the Travancore beaches from Quilon to Cape Comorin. These contain 8–10% thorium oxide and were exploited for the manufacture of gas mantles; the spread of electric lighting ruined this demand, but there has been a remarkable recovery. Titania from the ilmenite and cerium from the monazite are essential to some highly specialised electrical and chemical manufactures (electrodes, tracer bullets, and as a catalyst in benzine synthesis, amongst others) and recent developments in atomic research have made these deposits of great strategic significance. Production, which in 1925 fell to one hundred-weight of monazite, amounted in 1944 to 200,000 tons ilmenite, 2000 monazite, and 1600 zircon.

Population and Settlement

Population problems are very serious in Kerala; the density of Cochin in 1941 was the highest for any political unit in India—953 on a total area of 1493 sq mls—locally reaching 2000–4000 in a purely rural environment. Elankunnapuzha village had in 1941 no fewer than 18,173 people on its 3·8 sq mls—a density of 4782. The rate of increase has been very high—for

[46] A. K. Menon, "Fisheries of Cochin" (*IGJ* XIV (1939)), 229–36; C. D. Forde, *op. cit.*, 269.

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sitional areas—Comorin, Shencottah, Palghat, parts of Malabar. The importance of food-producing trees (coconut, areca, plantain, jackfruit) fits in with this: they are grown in the house compounds, so that the actual dwelling-space subtracts hardly anything from the cultivation-space, while

Fig. 122.—KERALA: COASTAL SETTLEMENT. 40 mls N of Cochin town. Dots, habitations; shaded, paddy. Note contrast between linear settlement on beach-ridges (under coconut) in W and ring settlement around lateritic rises in E. SOI 58 B/2; courtesy SOI.

at the same time the compounds ensure that the 'village' is loosely built, and may indeed spill all over the village lands. (Fig. 122.)[50]

Along the coast there is a marked linear tendency, houses and coconuts on the sandy ridges with their fresh ground-water, paddy in the lows. Inland the lateritic topography exercises a marked effect, settlement being strung out along valley-flanks or interfluves or forming a complete ring around the rises. (Fig. 123.)

[50] The 14th and the 20th centuries tell the same tale. "Mulaybar, which is the pepper country, extends for two months' journey along the coast. . . . there is not a foot of ground but what is cultivated. Every man has his own orchard, with his house in the middle and a wooden palisade all round it." (Ibn Battuta, *Travels in Asia and Africa, 1325–1354*, trans. H. A. R. Gibb (1929), 231–32). Along the 40 miles from Quilon to Trivandrum one is never out of sight of habitations or foot-travellers; G. Slater, *op. cit.*, 172.

406 The mhote too is seldom seen in these parts. The more common sorts of water-lifters are (1) an oval shaped bamboo-basket (costing about As. 2); (2) a wooden groove provided with a handle, costing about Re. 1; (3) and a frame-work consisting of two long bamboos, one small and another big in size balanced on a horizontal beam which is supported by two vertical poles; a picottah is attached to the small-sized bamboo and is drawn up and brought down by one or two persons standing opposite each other on two planks thrown across the middle of the well. The whole frame together with the picottah costs about Rs. 2. The oval shaped basket and the wooden groove are used to spread water from water courses and not from wells. Two persons, generally women, stand opposite each other on the side of a watercourse and pull the basket towards themselves by means of ropes tied round its 'ears' after filling it up with water; the extreme ease and facility with which they carry on the operations, often to the accompaniment of a snatch of song, is wonderful. The wooden groove is allowed to swing on a string and is moved to and fro by a person holding the handle.

651 The classes into which wet and dry lands are divided, the extent of each and the amount of assessment are subjoined.

Classes.	Wet lands.				Dry lands.	
	Single crop.		Double crop.		Single crop.	
	Area.	Assessment.	Area.	Assessment.	Area.	Assessment.
	ACS. C.	RS. A. P.	ACS. C.	RS. A. P.	ACS. C.	RS. A. P.
I ..	35 65	116 7 9	320 74	1,527 5 5	301 48	261 11 3
II ...	4 56	15 10 9	59 72	210 6 3	12 69	3 12 8
III ...	16 0	36 0 7	39 73	114 6 0	212 60	77 5 7
IV ...	21 37	39 9 8	15 51	34 11 2	68 39	17 10 3
V ...	109 59	147 9 11	11 5	17 12 11	207 53	44 6 8
VI ...	18 6	34 10 10	1 24	3 2 5	56 49	3 13 8
VII ...	...	...	...	...	78 3	37 0 3

125 The selling prices of cultivable wet land in the village are approximately Class I Rs. 1,500, Class II Rs. 1,000, Class III Rs. 800 Class IV Rs. 500—600, Class V Rs. 500.

311 The land is classified according to tenure as follows:—
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I. 'Pandaravaka Verumpattam' (Sirkar) non-favourable tenure.	Nilams (wet land) (A. 86·73).		109 pattadars.
	Parambas (dry land) (A. 210·88).		
II. 'Pandaravaka Kanam' (Sirkar) favourable tenure.	Nilams (A. 2·19) ...		4 pattadars.
	Parambas (7 cents) ...		
III. 'Puravaka' (outside Sirkar).	Nilams (A. 563·61) ...		54 pattadars.
	Parambas (A. 711·80) ...		
IV. Inams (gift tenure).	Nilams (71 cents) ...		6 pattadars.
	Parambas (A. 14·47) ...		